

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

Paper No. 15

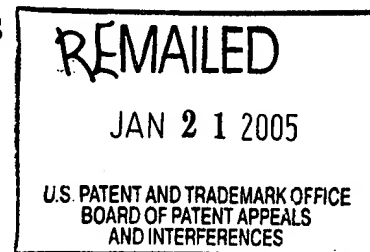
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHUNG-SHI LIU
and CHIH-CHENG LIN

Appeal No. 2004-0885
Application 09/689,930

ON BRIEF



Before KIMLIN, WARREN and KRATZ, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal and Opinion

We have carefully considered the record in this appeal under 35 U.S.C. § 134, including the opposing views of the examiner, in the answer, and appellant, in the brief, and based on our review, find that we cannot sustain the grounds of rejections of appealed claims 1 through 30¹ advanced on appeal: claims 1 through 7, 9 through 17, 19 through 27, 29 and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Jang in view of Többen et al. (Többen) and further in view of Orvek et al. (Orvek); and appealed claims 8, 18 and 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Jang in view of Többen and further in view of Orvek

¹ A copy of the appealed claims appears in the appendix to the brief.

and further in view of Pu et al. (Pu).²

It is well settled that in order to establish a *prima facie* case of obviousness under § 103(a), the examiner must show that some objective teaching, suggestion or motivation in the applied prior art taken as a whole and/or knowledge generally available to one of ordinary skill in this art would have led that person to the claimed invention as a whole, including each and every limitation of the claims arranged as required by the claims, without recourse to the teachings in appellant's disclosure. *See generally, In re Rouffet*, 149 F.3d 1350, 1358, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998); *Pro-Mold and Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1629-30 (Fed. Cir. 1996); *In re Fine*, 837 F.2d 1071, 1074-76, 5 USPQ2d 1596, 1598-1600 (Fed. Cir. 1988); *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988) ("The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that [the claimed process] should be carried out and would have a reasonable likelihood of success viewed in light of the prior art. [Citations omitted] Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure.").

In order to review the examiner's application of prior art to appealed claim 1,³ we must first interpret the language thereof by giving the claim terms their broadest reasonable interpretation in light of the written description in the specification, including the specification drawings, as it would be interpreted by one of ordinary skill in this art. *See, e.g., In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). The steps of the claimed method of photoresist processing encompassed by independent claim 1, and by claim 8 dependent thereon, at issue are:

....
forming a first photoresist layer over said composite layers of insulation and top insulating layer;

² Answer, pages 3-7.

³ Appellants state that "Claims 1-30 are in a single group of Claims" (brief, page 11). Thus, we decide this appeal based on appealed independent claim 1 and appealed dependent claim 8 as representative of the respective grounds of rejection. 37 CFR § 1.192(c)(7) (2002).

patterning a via hole pattern in said first photoresist layer by exposing it I-line 365nm radiation and developing;

forming a second photoresist layer over via patterned said first photoresist layer;

patterning a trench line pattern in second photoresist layer by exposing to deep-UV 248nm radiation and developing;

etching top and second layer of dielectric underlying first layer of photoresist using the via hole pattern layer;

etching said intermediate layer of dielectric under said second layer of dielectric using first layer of photoresist as a mask;

etching said composite layer of insulation transferring said trench line pattern into said first layer of photoresist and into said second layer of dielectric and transferring said via hole pattern into said intermediate layer of dielectric and into said first layer of dielectric;

removing said layers of photoresist and filling the trench line and via hole openings with metal.

We determine that the plain language of these clauses specifies that the first photoresist layer is near-UV sensitive and is via-hole positive patterned and developed, and the second photoresist is deep-UV sensitive and is deposited over the patterned first photoresist, including depositing the second resist *into* the patterned first photoresist where developing has removed areas of that photoresist representing via-holes. *See* specification **FIGs. 1B** and **2A** and the disclosure at pages 15 and 16 of the specification with respect thereto. Further, the step of trench positive patterning of the second photoresist over the via-hole areas of the first photo resist which contain the second photoresist, results in the open trench over via-hole area upon development because of the difference in the two photoresists specified by the different radiation sensitivities. *See* specification **FIG. 2B** and the disclosure at pages 16 and 17 of the specification with respect thereto. The series of three etching steps use the two photoresist layers, and in the third etching step, the trench pattern in said second layer of photoresist is transferred into said first layer of photoresist. The two photoresist layers are not otherwise removed until after the third etching step. *See* specification **FIGs. 3A** and **3B** and the disclosure at pages 17-19 of the specification with respect thereto.

The dispositive issue is whether this claimed arrangement of steps would have been suggested to one of ordinary skill in this art by the combined teachings of Jang and Orvek,

because Többen and Pu are not relied on in these respects. The examiner contends that Jang shows the steps of “forming a first photoresist layer and patterning it for a via . . . ; forming a second photoresist layer and patterning it for a conductive line[, that is, a trench] . . . ; etching the diverse layers to form a via and a trench . . . ; [and] removing the resist layers . . . ,” citing col. 5, line 64, to col. 6, line 42 (answer, page 4). The examiner further contends that Orvek shows the two resists specified in appealed claim 1, and discloses “[i]n one embodiment” a first photoresist layer that is near-UV sensitive and a second photoresist layer that is deep-UV sensitive, wherein the *second* layer is patterned and developed and the first layer is “blanket” or, as disclosed, “flood,” exposed to near-UV radiation “to transfer the image in the areas of the developed upper layer” to the first layer of the photoresist, which first layer is then developed; citing cols. 4-5 and Example 1 (answer, page 5). The examiner concludes that it would have been obvious from the combined teachings of these two references “to use a deep-UV resist over a near-UV resist in Jang . . . because Orvek teaches” that the different resists increase image and feature resolution (*id.*, page 6).

Appellant submits that Jang does not show the claimed sequence of steps using two different photoresists because the reference “teaches a conventional method of fabricating dual damascene openings[, that is, trench and via-hole openings,] by using two independent photoresist patterning multiple etchings steps,” in agreeing with the examiner that this reference does not disclose the two resists specified in appealed claim 1 in “a two layer resist system” (brief, pages 13-14). Appellant further contends that the process disclosed in Orvek “uses two different photo-resists to define only one pattern,” while agreeing with the examiner that this reference uses a photoresist layer with deep-UV sensitivity over a photoresist layer of near-UV sensitivity, (*id.*, page 15). Thus, appellant argues that one of ordinary skill would not have been led to use the two photoresist layers of Orvek in the method of Jang merely on the basis of an increase in resolution as taught by Orvek, and that the transfer of “only one image size pattern” would not have suggested the claimed method (*id.*, pages 15-16).

In response, the examiner acknowledges that the method of Jang does not form a “second [photo]resist layer over the first photoresist” (answer, page 8) and that “the two resist layers are formed and processed in sequence; i.e. the first resist layer is used to form the vias and is


removed prior to the application of the second resist layer,” thus differing from the claimed method wherein “the two resist layers are patterned in sequence” (*id.*, page 9; original emphasis deleted). The examiner relies on the teachings in Orvek of “the use of a two-layered resist system wherein the two layers have different spectral sensitivities and etch-selectivity in a metallization operation” which is recommended in the reference for “all metallization operations” (*id.*, page 10). The examiner argues that because “Orvek applies the two-resist system to a process very similar to the dual damascene process – interconnect metallization” one of ordinary skill in the art would have used Orvek’s “two resists for patterning” in Jang’s similar process (*id.*, pages 12-13).

On this record, we agree with the arguments advanced by appellant that the examiner has failed to make out a *prima facie* case of obviousness as to appealed claim 1, and thus as to appealed claim 8. Even if one of ordinary skill in this art would have applied Orvek’s two photoresist layer patterning method to Jang’s method, the result would have been the use of the two photoresist layers in forming a *single* pattern in *each* set of the two *sequential* sets of pattern photoresist, etch, and photoresist removal steps that, the examiner acknowledges, constitute the method as a whole of Jang. Thus, it is inescapable that the combined teachings of Jang and Orvek applied by the examiner taken as a whole would not have resulted in the process steps as arranged in the claimed method encompassed by appealed claims 1 and 8. *See Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1050-54, 5 USPQ2d 1434, 1438-41 (Fed. Cir. 1988). Therefore, in the absence of objective evidence and/or scientific reasoning in the record establishing why one of ordinary skill in this art would have modified the steps of the Jang process to arrive at each and every process step arranged as required by appealed claim 1, it is manifest that the only direction to appellant’s claimed invention as a whole is supplied by appellant’s own specification. *See generally, Dow Chem.*, 837 F.2d at 473, 5 USPQ2d at 1531-32. Accordingly, we reverse the grounds of rejection.

The examiner's decision is reversed.

Reversed

Edward C. Kimlin
EDWARD C. KIMLIN
Administrative Patent Judge


CHARLES F. WARREN
Administrative Patent Judge


PETER F. KRATZ
Administrative Patent Judge

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